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FTD-ID(RS)T-1046-89

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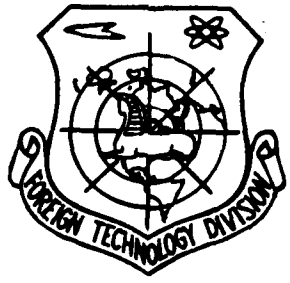
MODERNIZATION OF PRC METEOROLOGICAL SERVICE

by

Chen-Minlian



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HUMAN TRANSLATION

FTD-ID(RS)T-1046-89 15 March 1990

MICROFICHE NR: FTD-90-C-000276L

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English pages: 7

Source: Zidonghua Bolan, Vol. 1, 1989, pp. 11-12

Country of origin: China
Translated by: Leo Kanner Associates
F33657-88-D-2188
Requester: FTD/WE/Mr. Steven P. Weaver

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FOREIGN TECHNOLOGY DIVISION
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MODERNIZATION OF PRC METEOROLOGICAL SERVICE

Chen Minlian

The meteorological service system is a typical atmospheric information system. The timely, rapid gathering and processing of accurate meteorological information so that it can be put into service to safeguard the people and to build socialism is the sole aim of China's meteorological work. The recent explosive development of science and technology has provided many practicable measures for the automation, by means of computer technology, of the entire process of meteorological information monitoring, sensing, conversion, storage, transmission and processing, access and searching, and distribution. Currently, China has nearly 2,700 meteorological posts and stations distributed throughout the country. All these installations must make coded transmissions of the weather intelligence for their area, according to a uniform standard and within a number of minutes, with reference to world-wide or national/provincial exchanges, for use in weather forecasting and service. The high degree of dispersement of the posts and stations and the high degree of concentration of meteorological information have raised still more urgent requirements for the installation of computing devices for the modernization of weather intelligence and for the gradual implementation of the work processes.

The National Weather Bureau, in its work of modernization, places great emphasis on the use of developed computer technology. In 1959, China's first domestic model 104 electronic computer was successfully developed; it was used in making weather forecasts. On the basis of incomplete statistics, by the end of 1987, China's meteorological departments were calculated to have nation-wide over 50 large, medium-range, and small computers and 6,000 microcomputers of every kind (including pocket models and single-board computers). Under the National Weather Bureau's unification plan, the use of microcomputers by meteorological departments throughout the country is gradually being developed toward seriation and standardization. Currently, the large and medium-range model computers are concentrated in the units

directly subordinate to the National Weather Bureau (like the Beijing Weather Center and the Satellite Weather Center); the provincial level stations and the research and service units are all equipped with IBM-PC 16-bit microcomputers, high-grade 32-bit microcomputers, or small model computers. The local weather stations basically have Apple II 8-bit computers, and far the greater part of the county weather posts use PC-1500 pocket machines. In recent years, in all meteorological service systems, the computerized development includes over 400 projects; the widespread use of computers, especially microcomputers, in meteorological service in all areas has promoted the process of meteorological modernization. Premier Li Peng said in 1986: The weather departments in their use of electronic technology have their own special characteristics; they have promoted the quality of their work and the efficiency of their work, and are in the vanguard of the country. The modernization of the weather departments has taken a gratifying step.

Below we summarize the application of computers in all major weather service systems.

1. Semiautomation of weather observation through the use of microcomputers in the atmospheric sounding system.

Historically, the observation, modulation, calculation, encoding and reporting of several dozen key surface and high-altitude meteorological values carried out by our weather posts and stations several times daily have been performed completely by hand. The whole process had a high degree of manual labor and was subject to error. As of 1 January 1986, all basic national stations put into practice the use of PC-1500 pocket computers to perform automated surface observation calculations, reporting, and distributing; and the use of PC-1500's or microcomputers for high-altitude observation/sounding devices to check and verify the formularized graph processing and to adjust the sounding recording, the wind calculations, and the issuing of reports. These measures have moved our basic meteorological observation network service in the direction of semiautomation. Upper-level atmospheric satellite meteorology and weather radar soundings are the high-technology portion of the

atmospheric sounding system. In the middle of the 1980's, the National Weather Bureau's Satellite Weather Center imported HP-1000 and IBM-4361 computers with their peripherals, forming a receiving and processing system for material from the U.S. TIROS-N weather satellite. This advanced China's work in receiving, processing and using foreign weather data into a new era. In 1986, an IBM computer system was imported for the project of collecting and processing material from our first self-launched weather satellite; this system is the largest technological import to date of the National Weather Bureau, and includes three IBM 4381 main computers, three surface receiving stations and the Series-1 Satellite Weather Center peripheral computer, IBM PC/AT microcomputers, and so on. Some of the provincial weather bureaus and units have also implemented the use of microcomputers to process the cloud chart material from meteorological satellites; for example, the Gansu Province Weather Bureau was the first to utilize the remote-transmission artificially colored intensified satellite atlas.

2. Use of computers for the rapid transmission of weather information by the meteorological communications system.

The characteristics of meteorological work are that the volume of information is great, and that the information has a strong time value. For this reason, it is extremely important to establish a high-speed communications system. With the advice of Premier Zhou Enlai, the Beijing Weather Center took steps in 1973 to establish the Beijing Meteorological Communications Center, or BQS. (China's national weather center, the Beijing Weather Center is the heart of meteorological communications, data processing, and weather analysis and forecasting for the entire country, as well as the technological center; at the same time, it is one of the Asian weather centers of the international meteorological organization's world-wide monitoring network and a regional weather communications hub). With the import of the M-160 and M-170 computers, BQS was established at the end of the 1970's. The quantity of material of all kinds received from all over the world and processed every year has exceeded 10,000,000,000,000 words. It is linked by nearly 200 national and international high, medium and slow speed lines,

forming a national and international meteorological information network with Beijing as its center. Communications modernization has been realized for receiving, transmitting, reporting and editing, and distributing weather intelligence. In the middle of the 1980's, at Wuhan, Shenyang, Shanghai, Guangzhou and so on, regional meteorological communications hubs were partially formed with the PDP 11/44 small computer system.

3. Weather data computer processing systems.

In 1969, the Beijing Weather Center used the DJS-11 computer for computerized processing of non-real-time weather data. In 1973, the new DJS-8 (320 computer) was used; this made it possible to complete processing of the monthly report from the 680 weather stations in China within 7.5 hours. In 1985, the M-360R main-frame computer, with a calculation speed of 3,000,000 operations per second, was imported from the Fushitong [transliteration] Company of Japan, marking the completion of the second renovation of the computer system, which became the National Weather Data Processing System. The speed for processing the monthly reports of the basic national stations throughout the entire country was about five times the rate of the 320 computer; processing could be completed in 1.5 hours. The establishment of a world-wide meteorological data bank is one of the marks of modern meteorology; the Beijing Weather Center has set up on a M170 computer a world-wide real-time meteorological data bank, and has set up a preliminary world-wide historical weather data automated checking/searching system on the M360.

4. Quantified weather report service system.

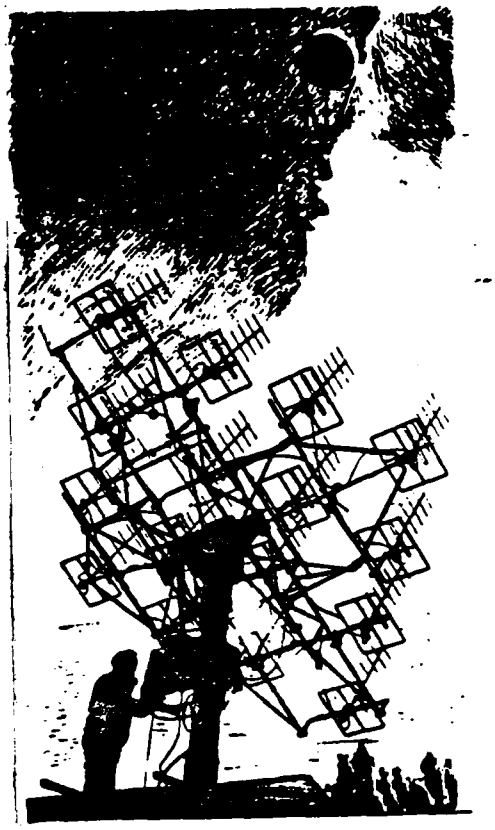
The use of electronic computers has set up the conditions that transformed China's weather forecasts from reports based on semi-empirical, semi-theoretical meteorological methods, to the modern objective quantitative forecasts whose most important feature is the use of mathematical formulas to implement calculated numerical value projections. Numerical forecasts are the true embodiment of forecasting objectivity, and an important channel for quantification and automation. They are also an important standard for

judging the level of meteorology in a country. In 1982, the National Weather Bureau's Beijing Weather Center set up on M-160 and M-170 computers a numerical forecast service system with an original five-layer equation schema of the northern hemisphere as its core; it is a series of linked-structure automated forecasting systems including data collection, real-time data processing, objective analysis, forecast schema calculations, statistical checking, chart output, data storage and facsimile transmission. The regional weather centers at cities like Shanghai, Wuhan, and Guangzhou have set up numerical forecasting service systems on the small VAX-11-780 computer for typhoons, storms, and limited tropical regions. All provincial and local weather stations use the numerical weather forecasting products issued by the national and regional centers, which make use of many kinds of objective, quantitative products (like the schema output statistical method and the complete forecast method) in interpreting forecasting method, to undertake forecasting for their province, municipality, or region using microcomputer processing and statistical calculations. A distributed style weather forecast service information processing system has thus been established in China.

5. The weather service system also uses microcomputers.

Microcomputers have also been put to use in the public welfare and special weather services at China's weather stations. For example, the Central Weather Station's television weather report program is produced with computers. In not a few provinces, there has been realized a telephonic channel microcomputer communications network between the provincial government, the provincial flood control command center, and other important service units; important weather forecasts, intelligence and satellite maps, images showing actual weather conditions, and graphs and figures, can be transmitted at any time and displayed on multiple terminals. The Dalian weather station uses microcomputers to implement forecast service for oceanic navigation, and the weather station of Heilongjiang Province used microcomputers to develop the forest fire danger forecast service for the Daxinganling Mountains, raising the timeliness and precision of the reports.

In addition to the above five major weather service systems mentioned above, the use of microcomputers has had very good results in the areas of weather service management, automation of office tasks, research, agricultural meteorology, education, appraisal of instruments, and so on. The Beijing Weather Center, in its automated office system, has developed software for personnel management, payroll management, stock management, comprehensive statistics, text and files content management. The National Weather Bureau has made a uniform design for microcomputer systems to manage the personnel, meteorological equipment, research and education, written materials, and finances of all provincial weather bureaus. The National Weather Bureau also has opened communications reports between the weather bureaus in all provinces and set up a long distance Chinese report transmission system. Documents may be exchanged, displayed, and printed at any time by the microcomputers. This method is secure and reliable, as well as speedy and convenient.



In summary, the use of computers, though it has penetrated to every area of China's meteorological service, shows great development in breadth and depth; it has produced gratifying results.

Based on China's "Summary of Modernization, Construction and Development in Meteorology," the seventh five-year plan saw the development of the following important projects in the area of microcomputer application:

1. An enormous computer system was imported at the Beijing Weather Center to establish our mid-period numerical weather forecasting service system; it produces 5-7 day numerical weather forecasts.

2. A large-scale surface receiving and processing system, controlled by computers, for satellite weather data has been placed in service.

3. A high-speed computer-to-computer data transmission communications system has been opened joining the National Weather Center with the already existing Shanghai Regional Weather Center and the soon-to-be-constructed weather centers in Wuhan, Guangzhou, Liaoning, Lanzhou, and Chengdu.

4. Experimental mid and small-scale weather system bases using medium and small computers to process data have been constructed and are in use in Beijing/Tianjin/Hebei and the middle and upper reaches of the Yangzi River.

5. Widespread use of microcomputers for purposes especially appropriate to China is developing, forming a unified coordinated national weather service computer system.

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